

REPORT FROM DESY.

KET Annual Meeting
Physikzentrum Bad Honnef
November 21, 2025

Ulrich Husemann
Director of Particle Physics
Deutsches Elektronen-Synchrotron DESY

HELMHOLTZ





Hamburg

DESY



Zeuthen



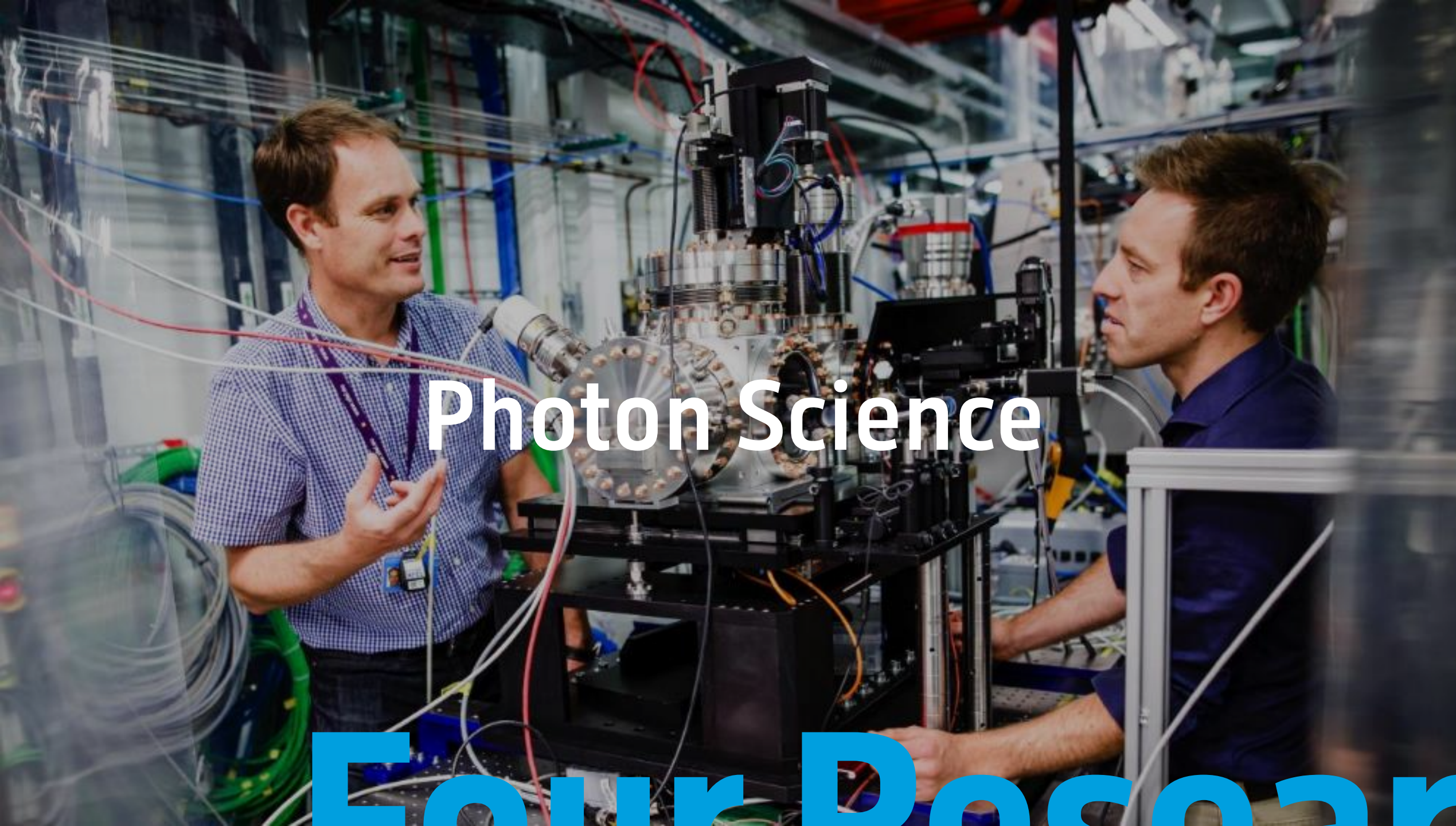


Hamburg

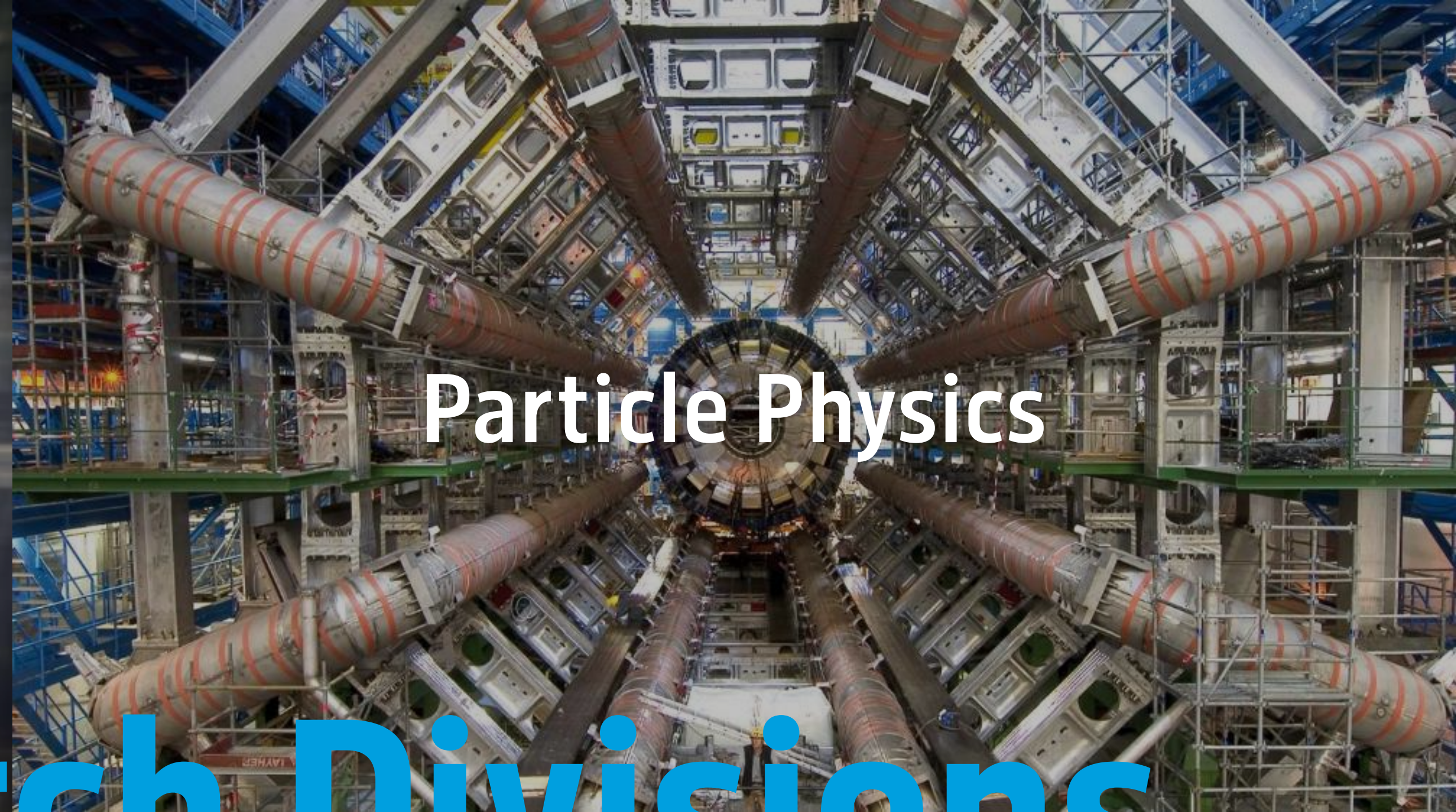
Two Sites



Zeuthen

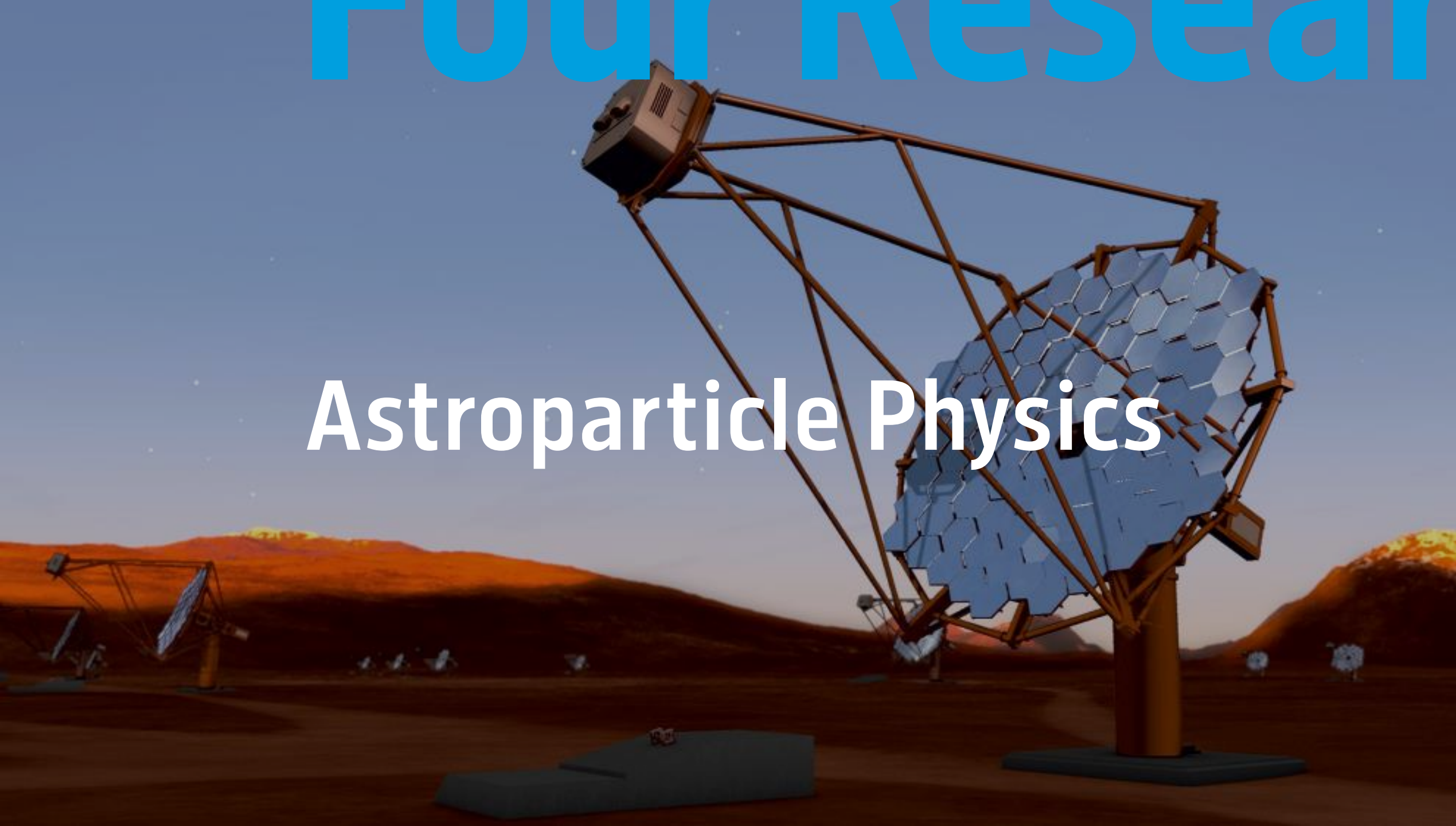


Photon Science



Particle Physics

Four Research Divisions



Astroparticle Physics



Accelerators

News from DESY.

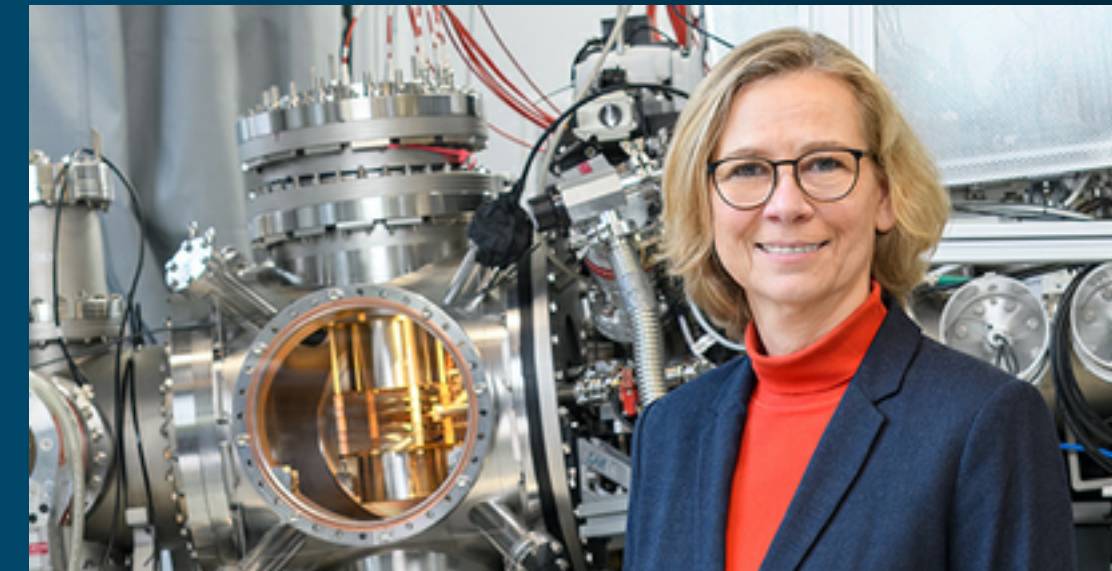
The DESY Directorate as of November 2025



Iris Wilhelm
Administration (since 04/2025)



Beate Heinemann
Chairperson (since 04/2025)



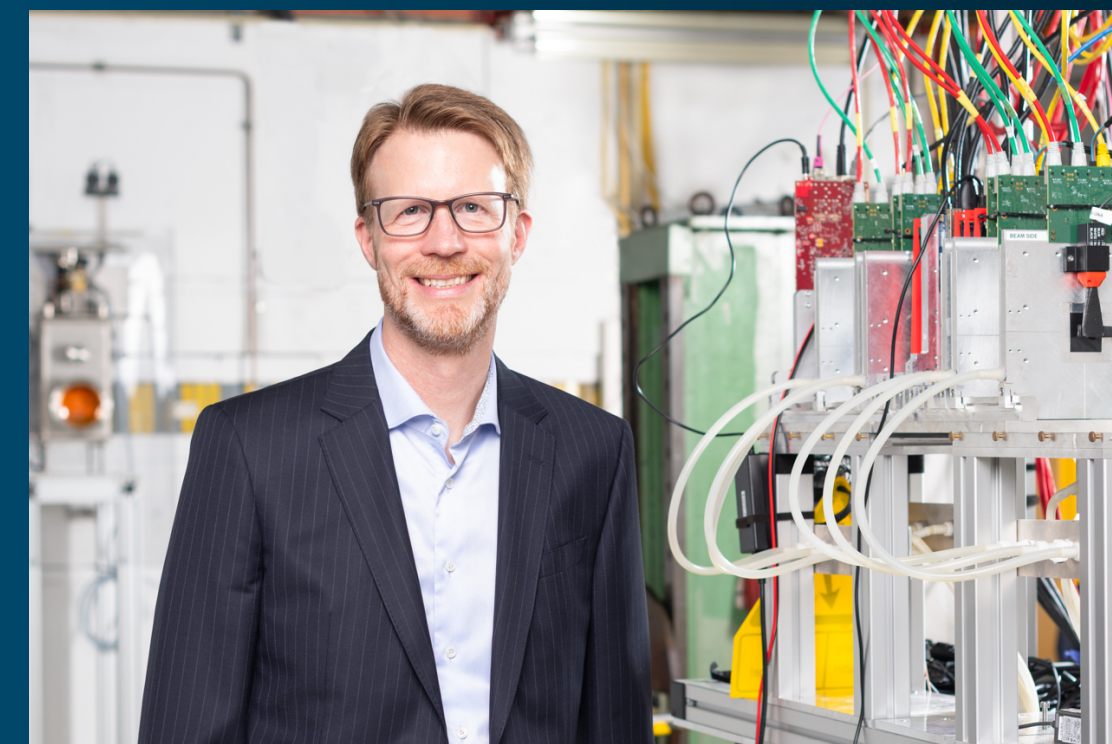
Britta Redlich
Photon Science (since 01/2025)



Wim Leemans
Accelerators



Christian Stegmann
Astroparticle Physics

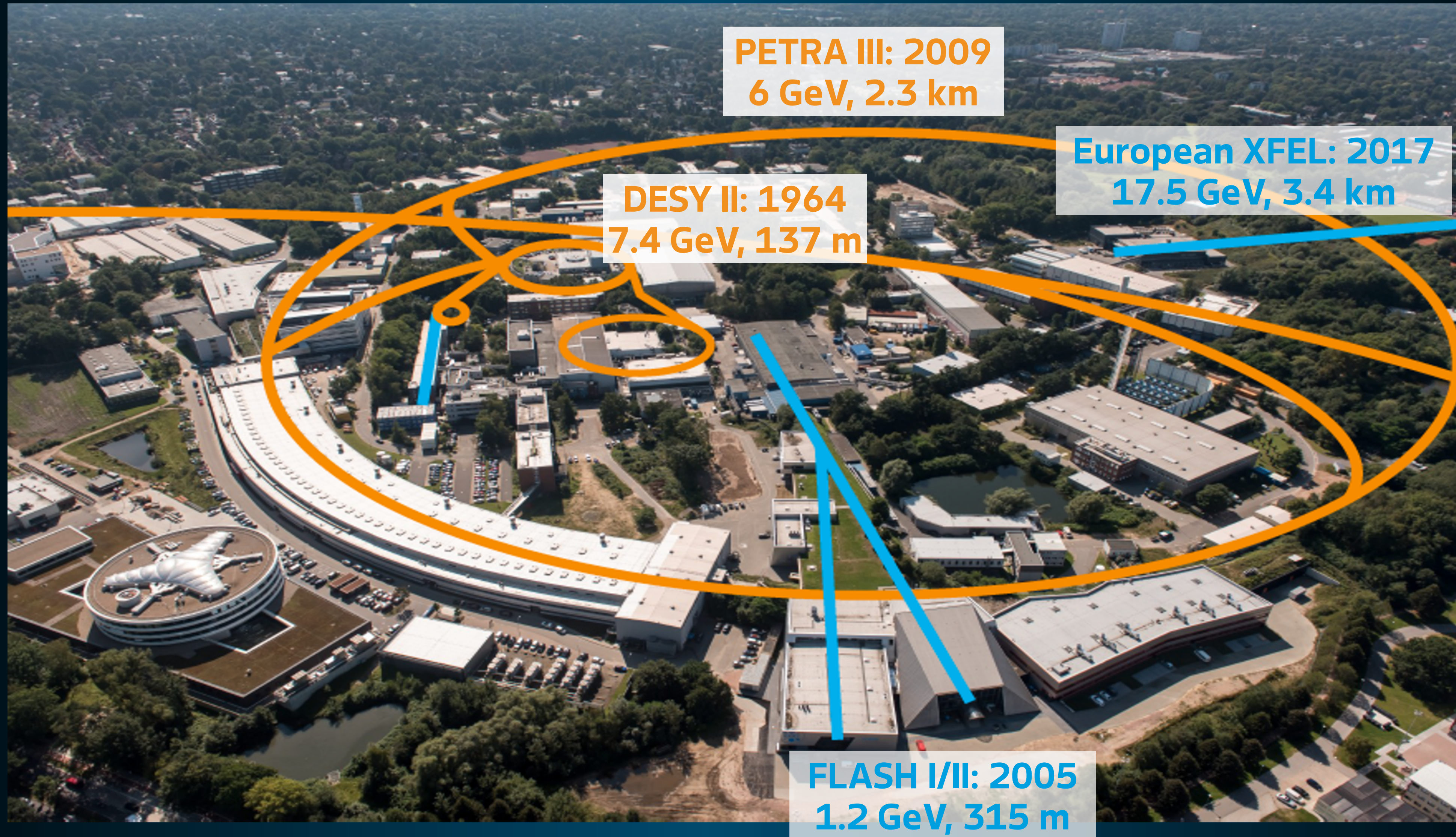


Ulrich Husemann
Particle Physics (since 11/2025)



Miriam Hufnagl
Chief Technology Officer (interim)

Accelerators Operated by DESY Today



German Roadmap for Research Infrastructures

Prioritized Projects with Major DESY Involvement (Decision: July 2025).

PETRA IV

Ultimate 4D X-Ray
Telescope



IceCube Gen2

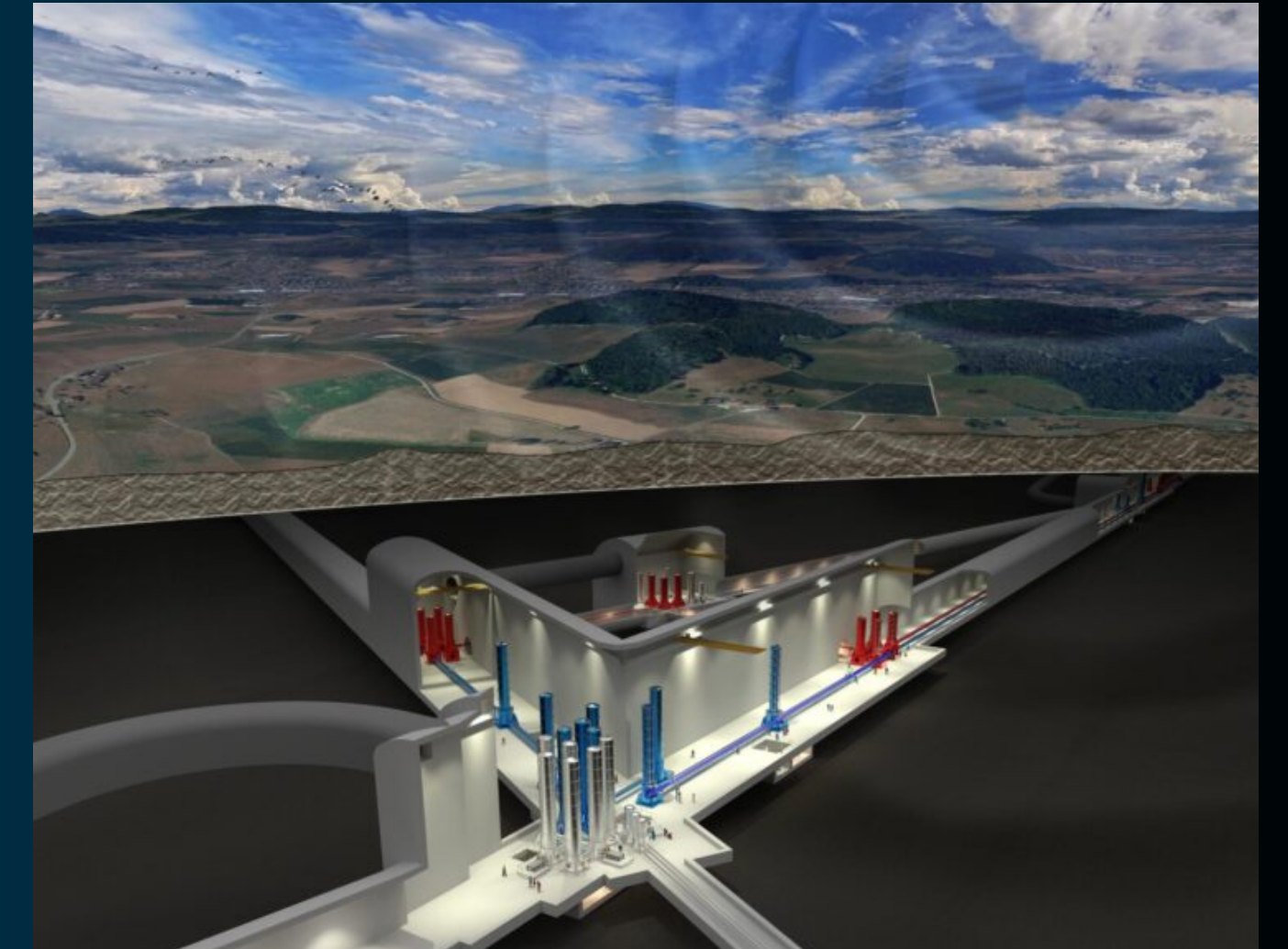
Neutrino Observatory



ICECUBE
GEN2

Einstein Telescope

Preparatory Phase



PETRA IV

The Ultimate 4D X-ray Microscope.

PETRA IV: next large-scale accelerator project at DESY

- Upgrade of X-ray light source PETRA III – 500 times more powerful
- Broad range of applications, unique analytics for, e.g., drug development, microelectronics, materials science

Project status:

- Project review by committee installed by Wissenschaftsrat on December 2/3, 2025
- Expected construction: 2029–2031



Significant Grants

Connected to Particle Physics at DESY.

CRC with Hamburg University (2024):

"Higher structures, module spaces and integrability" (physics & mathematics)



CRC members at its kick-off meeting in front of Hamburg University

New ERC Synergy Grant (2026):

"Studying High-field QED with Plasma Accelerators and High-powered Lasers"



From left to right: A. Maier & J. List (DESY), H. Vincenti (CEA), A. di Piazza (U Rochester)

DESY Particle Physics as a Partner

Of Regional, National, and International Communities

Excellence Strategy:

- **Quantum Universe** (U Hamburg/DESY): second funding period
- **Color meets Flavor** (Bonn/Dortmund/Siegen/Jülich): **new** cluster
- Three further U Hamburg clusters beyond particle physics: CUI, UWA, Bluemat

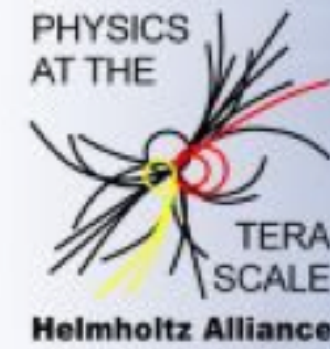
European and international committees:

- Lab Directors Group (LDG)
- ECFA and ICFA
- European Strategy Group (ESG)



Terascale Alliance

Schools and Workshops.



PHYSICS AT THE TERASCALE
Helmholtz Alliance



Schools in 2025

- Statistics (72 participants)
- Advanced Programming Concepts (31 participants)
- Monte Carlo (27 participants)
- Introduction to the Terascale (25 participants)

Renowned international speakers:
G. Cowen, R. Barlow, T. Sjöstrand, ...

Tutorials from big software tools:
Julia, Pythia, Herwig, Sherpa

Coordinated program by ErUM-Data-Hub
offering Machine Learning Schools



Statistics School 2025

Terascale Alliance

Schools and Workshops.

Workshops in 2025

- Terascale Detector workshop (102 participants)
- Computer Algebra and Particle Physics (48 participants)
- Asymptotic Safety meets Particle Physics and Friends (17 participants)

Web: http://www.terascale.de/schools_and_workshops/

Feedback/suggestions: anacen@desy.de

Deutsches Elektronen-Synchrotron DESY + + + Karlsruher Institut für Technologie + + + Max-Planck-Institut für Physik München + + +
Rheinisch-Westfälische Technische Hochschule Aachen + + + Humboldt-Universität zu Berlin + + + Rheinische Friedrich-Wilhelms-Universität Bonn + + +
Technische Universität Dortmund + + + Technische Universität Dresden + + + Albert-Ludwigs-Universität Freiburg + + + Justus-Liebig-Universität Gießen + + +
Georg-August-Universität Göttingen + + + Universität Hamburg + + + Ruprecht-Karls-Universität Heidelberg + + + Johannes Gutenberg-Universität Mainz + + +
Ludwig-Maximilians-Universität München + + + Universität Regensburg + + + Universität Rostock + + + Universität Siegen + + + Julius-Maximilians-Universität
Würzburg + + + Bergische Universität Wuppertal + + +

17th Terascale Detector Workshop

March 17-21, 2025

Program:

- Detector R&D for future colliders
- Phase II upgrades ATLAS and CMS
- Phase IIb upgrades ALICE and LHCb
- Artificial intelligence for detectors

Detector school (March 17-18):

Micropattern gaseous detector

Rheinische Friedrich-Wilhelms-Universität Bonn

© Frank Luenweg / Universität Bonn

Organizing Committee

Jochen Dingfelder, Doris Eckstein, Lutz Feld, Tobias Flick, Ulrich Husemann,
Oliver Kortner, Lucia Masetti, Andreas Mussgiller, Ulrich Parzefall,
Hans-Christian Schultz-Coulon, Felix Sefkow, Frank Simon, Arno Straessner

Local Organizers

Markus Ball, Florian Bernlochner, Klaus Desch, Yannick Dieter, Jochen Dingfelder,
Ingrid Gregor, Matthias Hamer, Philip Hauer, Fabian Hügging, Jochen Kaminski,
Bernhard Ketzer, Sebastian Neubert, Matthias Schott, Slavomira Stefkova,
Marco Vogt

Website:

<https://indico.desy.de/event/47789/>



Please register by March 3, 2025

DESY Summer Student Program

July 21 to September 10, 2026

Students of physics and related disciplines join research groups at DESY for 7.5 weeks (2025: 86 students, 41 in particle physics)

Individual projects and lectures include:

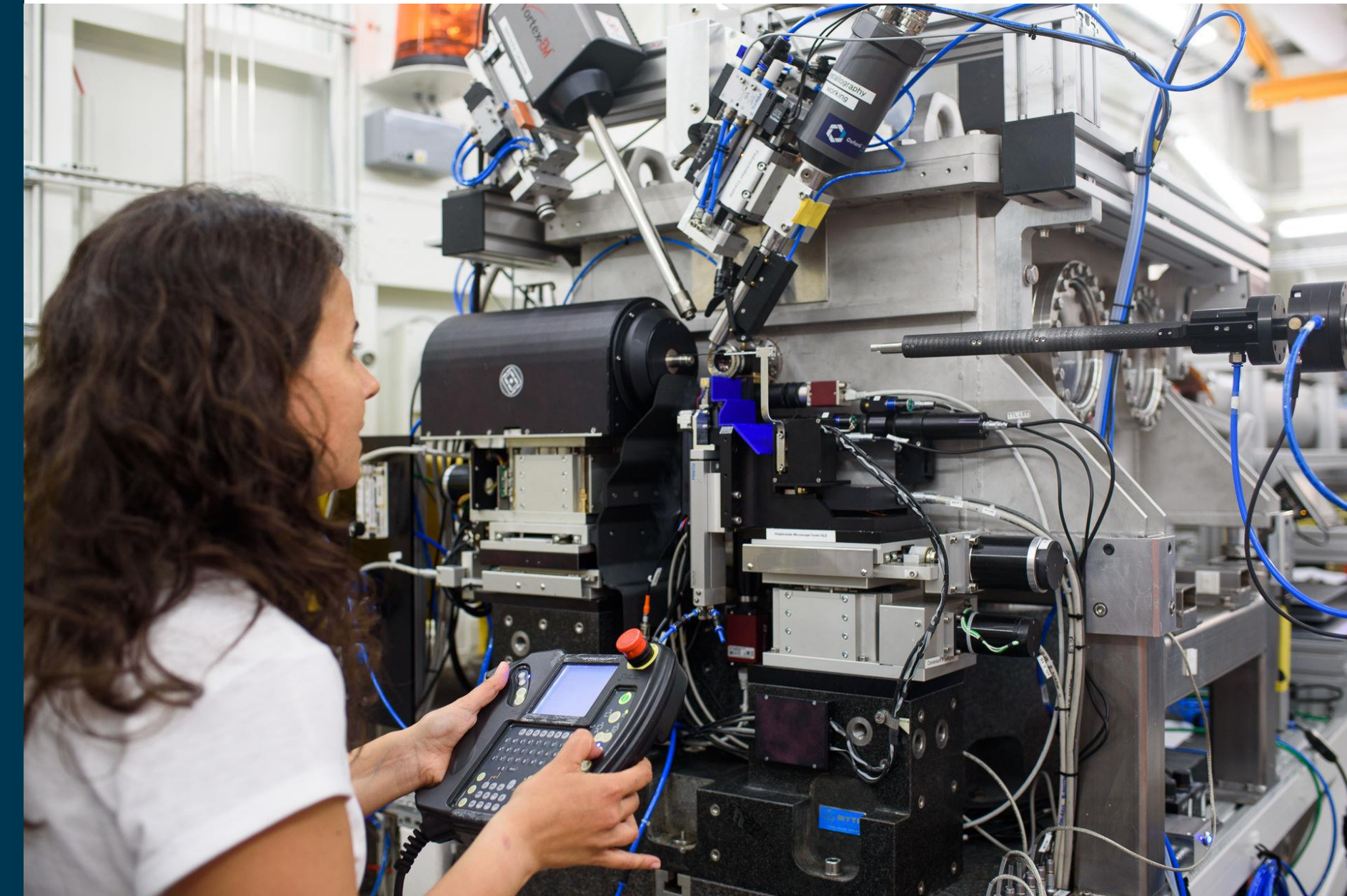
- (Astro)particle physics: data analysis, theory, software, computing
- Accelerator and detector physics
- Photon science: research with synchrotrons, FELs, lasers, theory, computing

Prerequisite: ≥ 3 years of university-level studies

Further details: www.desy.de/summerstudents

SUMMER STUDENTS.

DESY International Summer Student Programme
21 July to 10 September 2026



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DESY is one of the world's leading research centres for photon science, particle and astroparticle physics, as well as accelerator physics.

Each summer DESY invites up to 100 students in physics and related disciplines to join research groups and participate in their activities. The summer student programme consists of individual research projects and complementary lectures.

Application deadline is 31 January 2026

Qualified applicants should have completed three years of full-time studies at university level by summer 2026. All participants will receive financial support.

Photon Science

Projects are offered at DESY as well as EuXFEL and include research with synchrotrons, FELs, and optical lasers on molecules, soft matter, solid-state and nanomaterials, the development of new experimental techniques, the theory of light-matter interaction, and scientific computing.

Elementary Particle, Astroparticle and Accelerator Physics

Projects center around the experiments in elementary particle physics (ATLAS, CMS, BELLE II, ALPS II, and future experiments), astroparticle physics (CTAO, IceCube, RNO-G, HESS, ULTRASAT, and the Einstein Telescope), development of novel particle accelerators and detectors, particle physics theory, and scientific computing within the Worldwide LHC Computing Grid.



www.desy.de/summerstudents

Deutsches Elektronen-Synchrotron DESY
A Research Centre of the Helmholtz Association

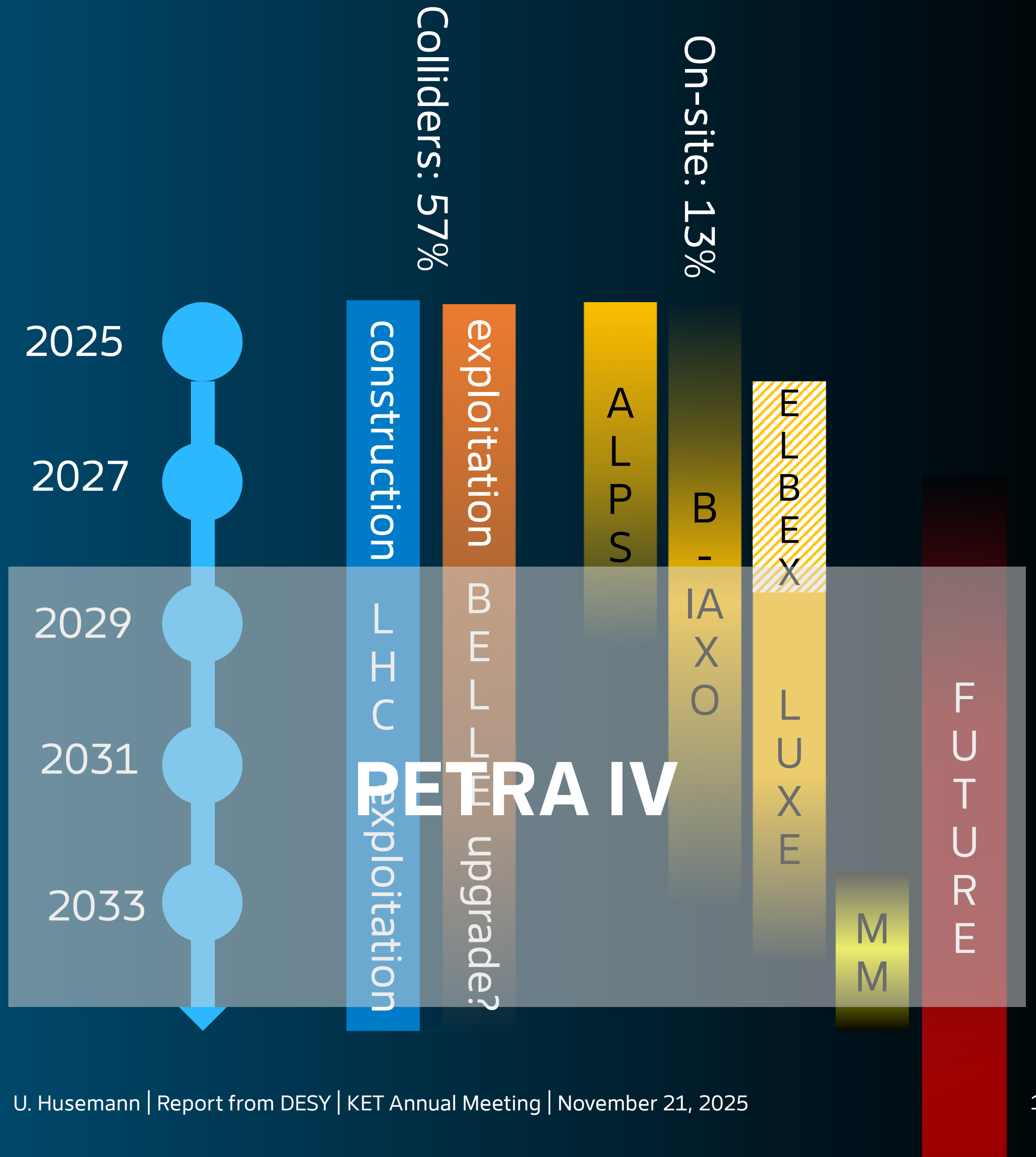
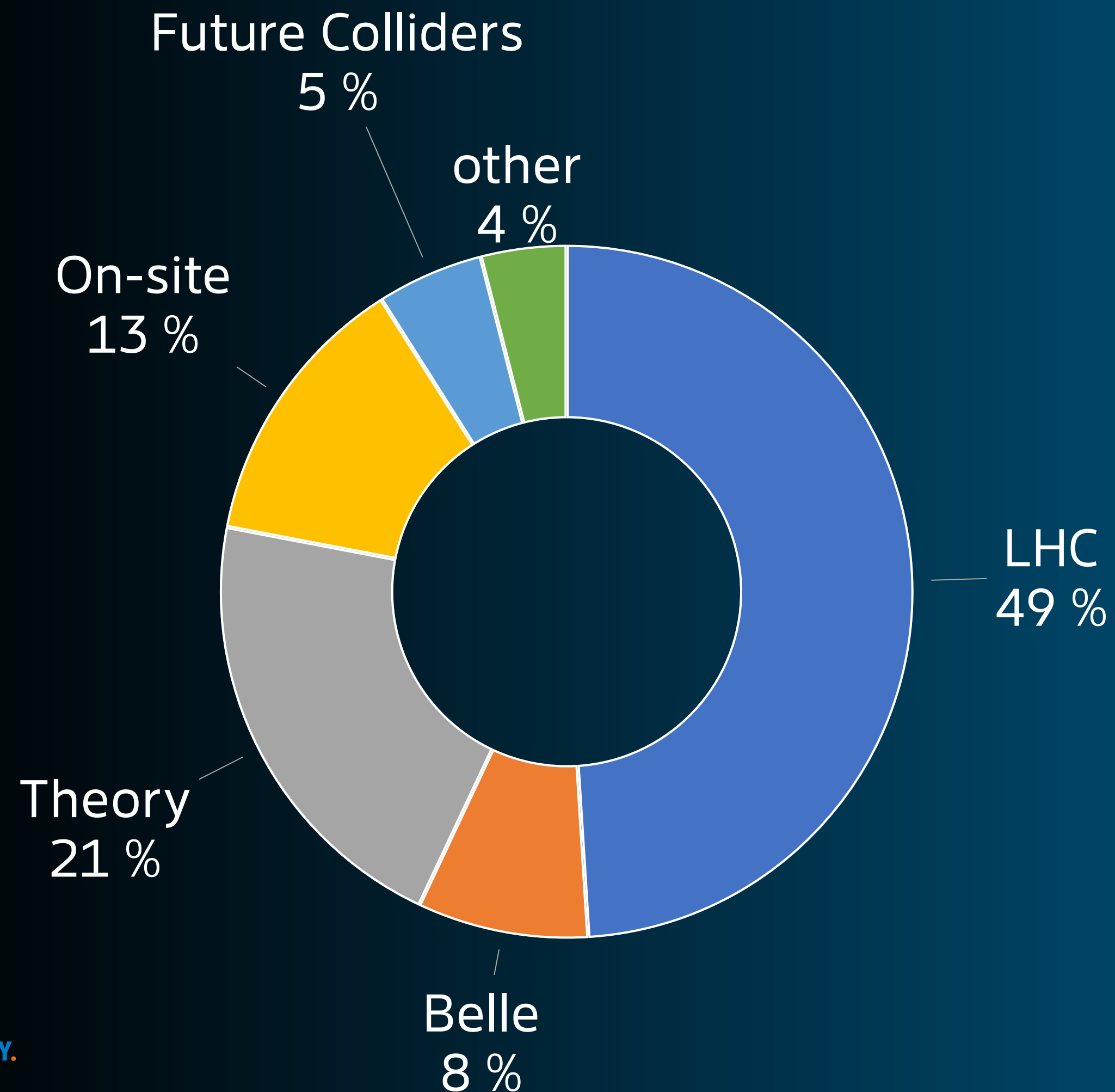


Particle Physics at DESY: Infrastructures and Highlights

Particle Physics at DESY

Our Portfolio and Roadmap.

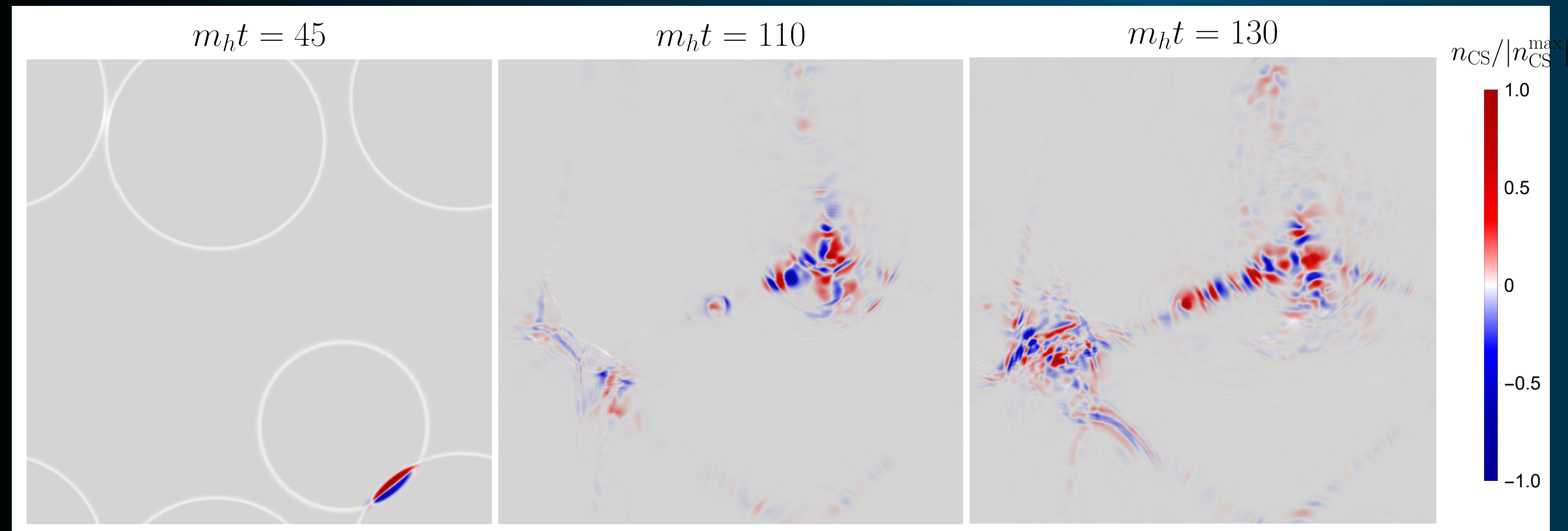
Relative weight of activities (Hamburg)



Selected Highlights

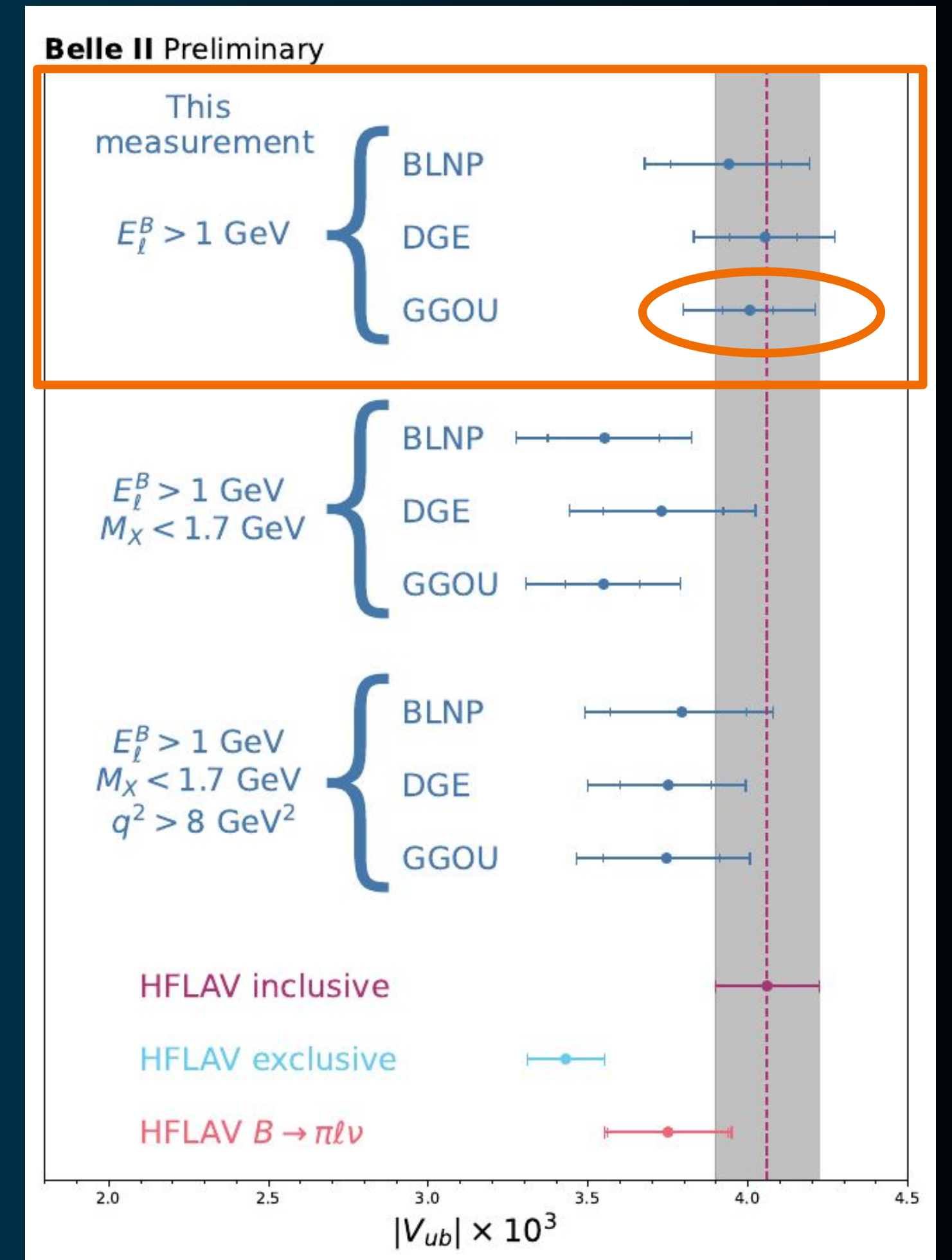
Theoretical Cosmology and Flavor Physics with Belle II.

Baryon number violation from SM Higgs Bubble Collisions



N. Bhusal et al., <https://arxiv.org/abs/2508.21825> (animation)

$|V_{ub}|$ from inclusive $B \rightarrow X_u \ell \nu$

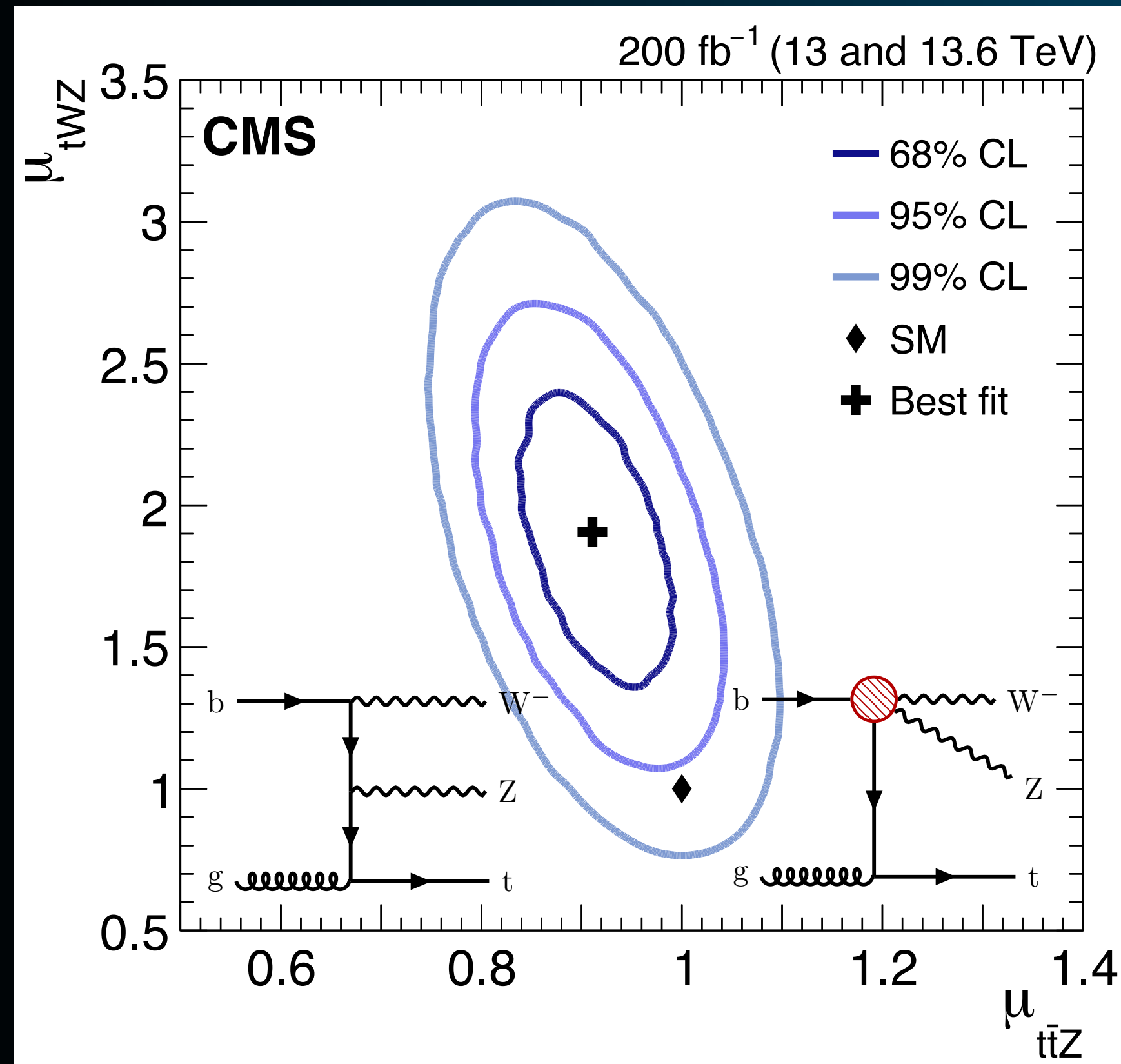


G. Gaudino, [EPS HEP 2025](#), paper in preparation

Selected Highlights

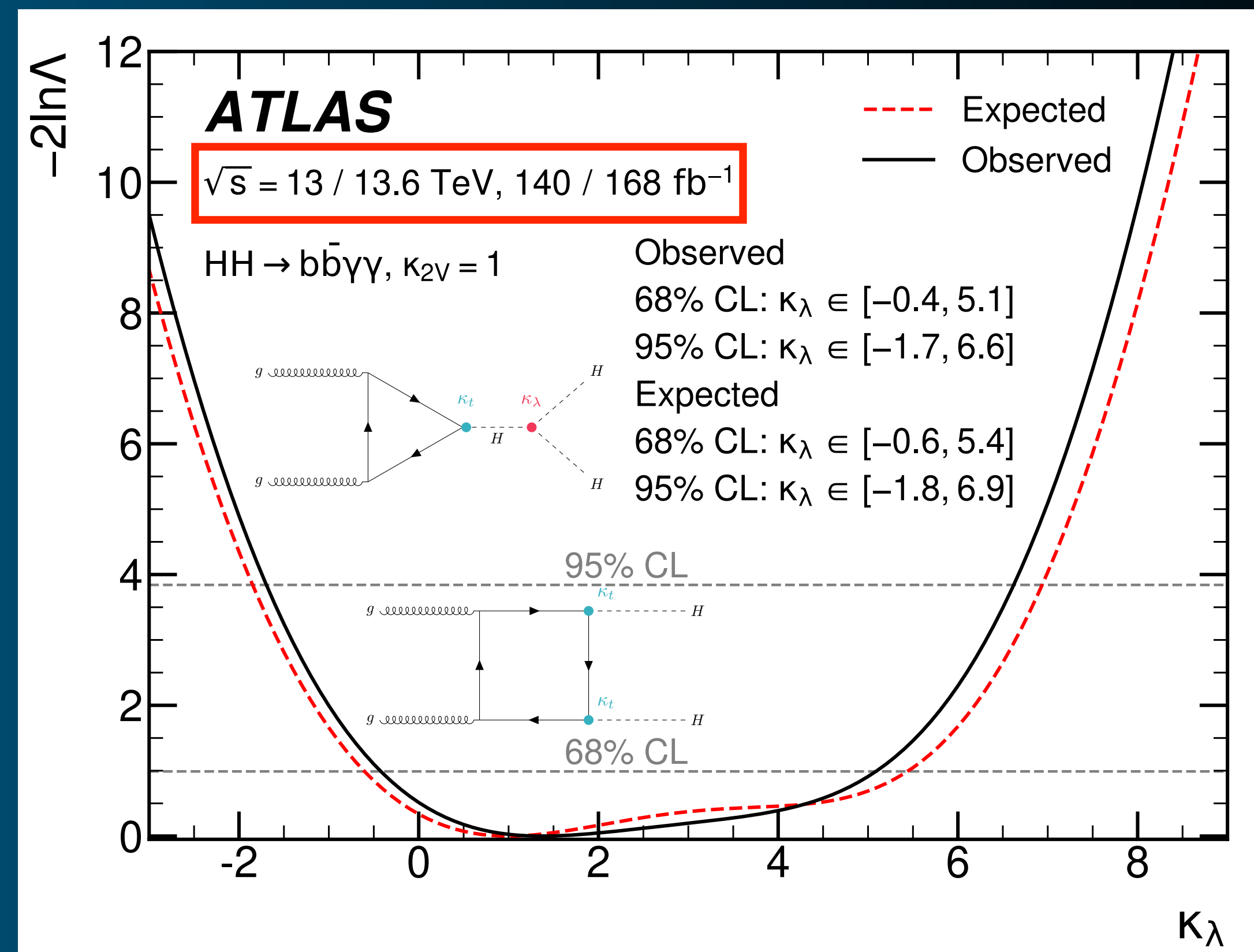
Top-quark and Higgs-boson Physics at the LHC.

Observation of tWZ Production



<http://arxiv.org/abs/2510.19080>, submitted to PRL

HH → bbγγ with 308 fb⁻¹ from Run 2/3



<https://arxiv.org/abs/2507.03495>, submitted to PLB

Theoretical Physics & Wolfgang Pauli Centre

The Intellectual Foundation.

Theoretical particle physics at DESY

- Collider Phenomenology ("pheno")
- Particle Physics and Cosmology
- String Theory and Mathematical Physics ("formal theory")
- Zeuthen Particle Physics Theory (ZPPT):
phenomenology and lattice QCD



Wolfgang Pauli Centre: interdisciplinary center for theoretical physics in Hamburg
→ goal: WPC in a building



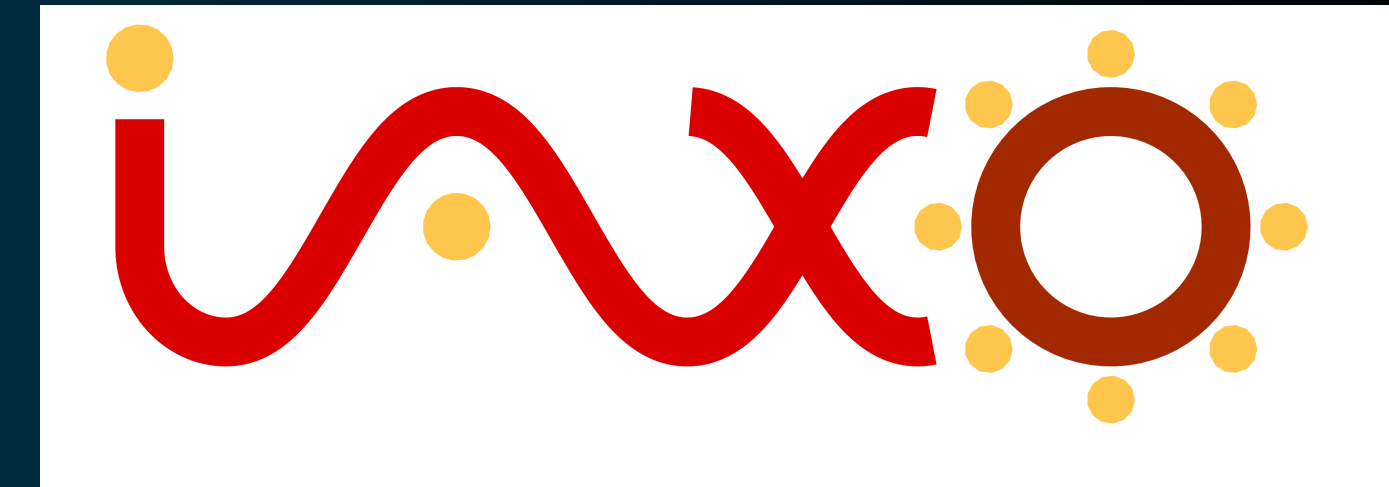
On-site Experimental Program

From axion-like particles to Quantum Electrodynamics (QED) under extreme conditions.

ALPS: Any Light Particle Search (data-taking since 2023): "Light-shining-through-the-wall" experiment to search for light particles



BabyIAXO: International Axion Observatory (site prep ongoing): "Helioscope" to search for axions potentially emitted from the sun



MADMAX: Magnetized Disc and Mirror Axion Experiment: "Haloscope" to search for axion dark matter (first results with prototypes):



LUXE: Laser und XFEL Experiment (beam line prep ongoing): QED in the strong-field regime



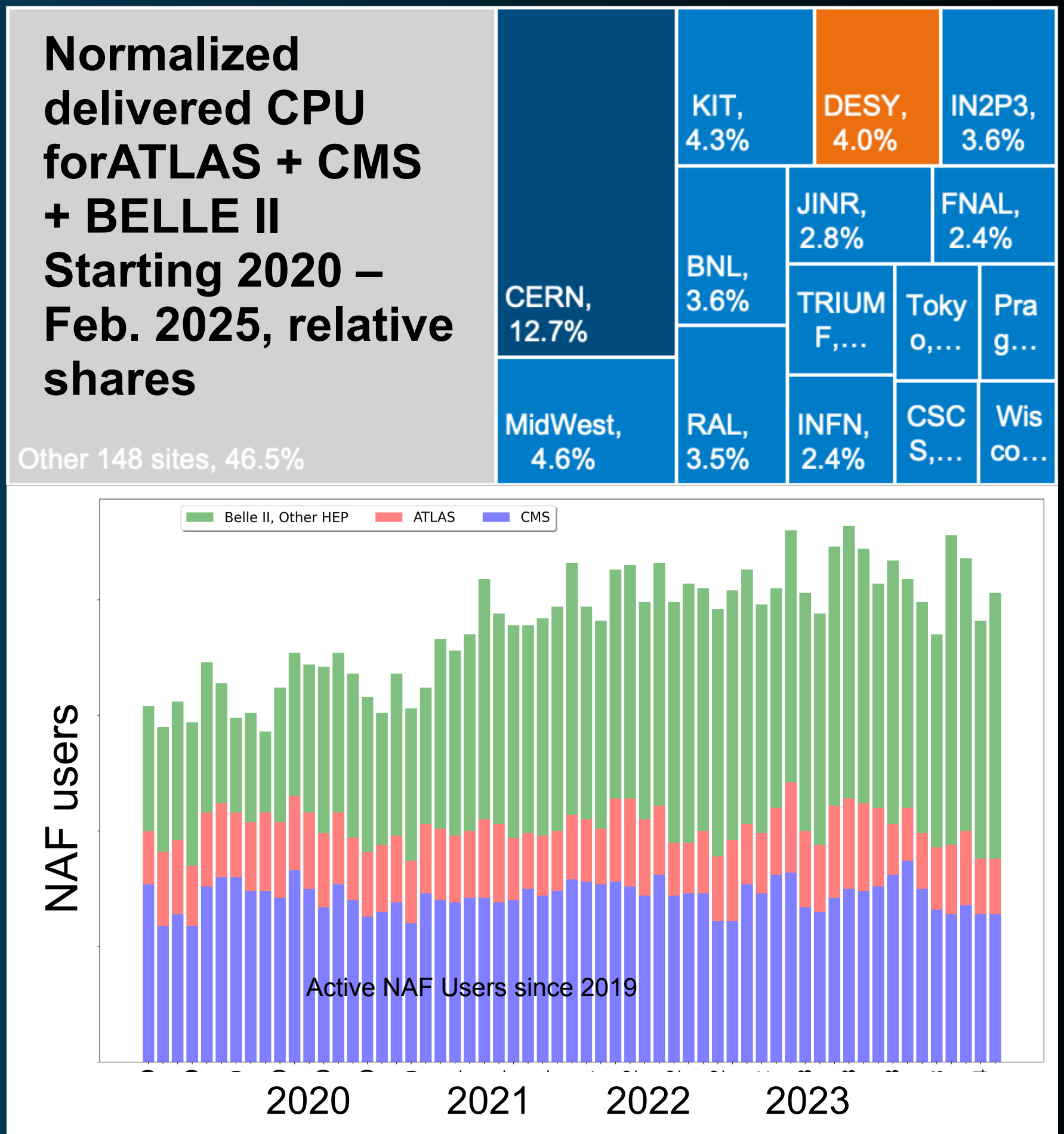
Computing and IT

For Particle Physics and Beyond.



IDAF – Interdisciplinary Data and Analysis Facility

- **DESY Grid** (Hamburg & Zeuthen): large **WLCG Tier-2 center**
- **National Analysis Facility** (NAF) to complement the grid
- **Data center** for Belle II and CTAO
- **HEP data hosting** in Germany (gradually replacing university Tier-2s)
- **High-performance and high-throughput computing** (e.g. for PETRA)
- ... and a small but very active **support team**



Beam Test Facility

Key Infrastructure for Detector Development

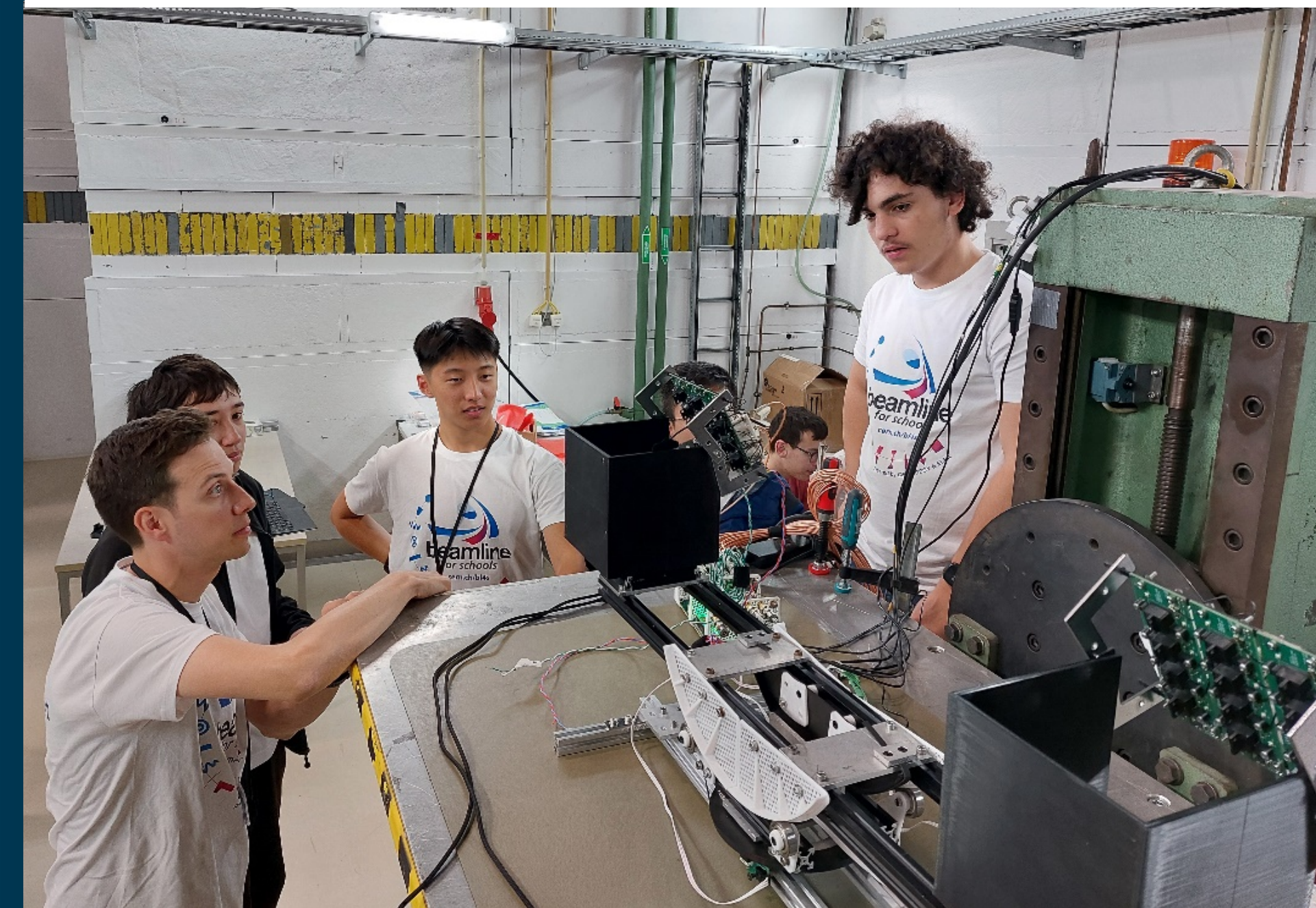
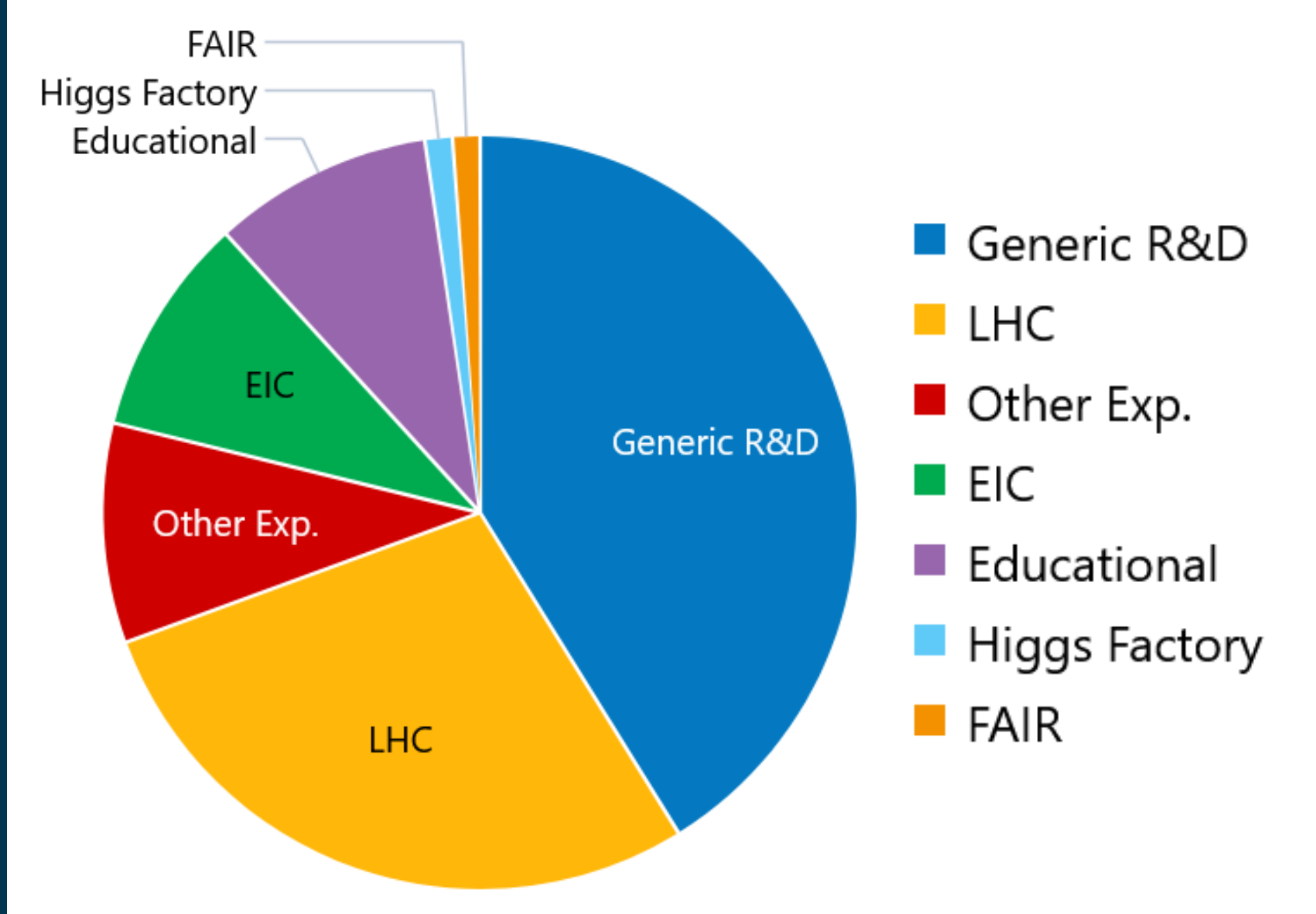
Test beam in 2025 (status: Nov 2):

- 376 users - 167 from German institutes, 50% students
- 105 slots (weeks) – 81% used
- New: ALPIDE-based telescopes

Plans:

- 2026 schedule finalized → again well booked
- Shutdown 09/26–02/27, many more users expected during CERN LS3 and Fermilab test beam shutdown
- Test beam in PETRA IV era: discussions ongoing!

Beamline for Schools 2025: testing self-designed muon detector and testing organic scintillators



A refreshed assessment of the importance of physics to the European economy

A CEBR REPORT FOR THE EUROPEAN
PHYSICAL SOCIETY (EPS)



July 2025
European Physical Society



News from EPS European Physical Society

Two new **EPS Historic Sites** in Germany in
2025: Göttingen (April), KIT (October)



Various **EPS Prizes**: please nominate!

Update of assessment of the **importance
of physics to the European economy**

Thank You

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